



Name :
Roll No. :
Invigilator's Signature :

CS/B.TECH(CSE/IT)(OLD)/SEM-4/EC-411/2012

2012

PRINCIPLES OF COMMUNICATION ENGINEERING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

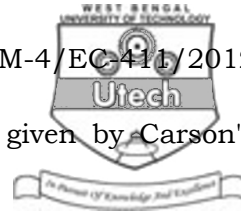
- i) The high frequency range extends from
 - a) 300 kHz - 3000 kHz
 - b) 3 MHz - 30 MHz
 - c) 30 MHz - 300 MHz
 - d) 300 MHz - 3000 MHz.
- ii) The function of the input transducer in a communication system is
 - a) to transmit the message signal
 - b) to modulate the message signal
 - c) to convert message sound signal into electrical signal
 - d) none of these.

4301(O)

[Turn over



- iii) The positive RF peaks of an AM voltage rise to a maximum value of 12V drop to a minimum value of 4V. The modulation index assuming single tone modulation is
- a) 3 b) $\frac{1}{3}$
- c) $\frac{1}{4}$ d) $\frac{1}{2}$.
- iv) The main advantage of super-heterodyne receiver is
- a) simple circuit
- b) better tracking
- c) improvement in selectivity & sensitivity
- d) better alignment.
- v) The resonant frequency of an RF amplifier is 1 MHz and its bandwidth is 10 kHz. The Q factor will be
- a) 10 b) 100
- c) 0.01 d) 0.1.
- vi) Armstrong FM transmitter performs frequency multiplication in stages
- a) to increase the overall S/N ratio
- b) to reduce bandwidth
- c) to find the desired value of carrier frequency as well as frequency deviation
- d) for convenience.



vii) Bandwidth of a single tone WBFM, given by Carson's Rule is

- a) $\Delta\omega + \omega_m$ b) $2(\Delta\omega + \omega_m)$
c) $2\Delta\omega$ d) $2\omega_m$.

viii) Which of the following modulations is digital in nature ?

- a) PAM b) PPM
c) DM d) AM.

ix) A super-heterodyne receiver with an IF of 450 kHz is tuned to a signal at 1200 kHz. The image frequency is

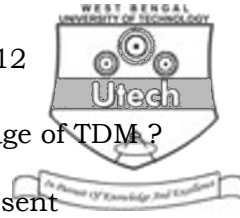
- a) 750 kHz b) 1650 kHz
c) 2100 kHz d) 2000 kHz.

x) Companding is used in PCM to

- a) reduce bandwidth
b) reduce power
c) increase S/N ratio
d) get almost uniform S/N ratio.

xi) In the bipolar NRZ or AMI line codes the binary zero is represented by

- a) alternate 0s and 1s
b) alternate + A and - A amplitudes
c) zero amplitude
d) none of these.



- xii) Which of the following is a disadvantage of TDM ?
- a) Inter-modulation distortion is absent
 - b) Full available channel bandwidth can be utilized for each channel
 - c) Due to slow narrow band fading all the TDM channel may get wiped out
 - d) Problem of cross talk is severe.
- xiii) Which of the following is not a property of Hamming code ?
- a) No. of check bits $q \geq 3$
 - b) Block length $n = 2^q + 1$
 - c) No. of message bits $k = n - q$
 - d) Minimum distance $d_{\min} = 3$.
- xiv) The height of the geostationary satellite from the earth surface is approximately
- a) 42,600 km
 - b) 15,000 km
 - c) 35,786 km
 - d) 6,400 km.
- xv) The range of azimuth angle in satellite communication is
- a) 0° to 90°
 - b) 0° to 360°
 - c) 0° to 180°
 - d) 90° to 180° .



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) Why modulation is needed ?
b) What do you mean by AM envelope ?
c) What are the frequency components in an AM wave ?
Write the bandwidth of AM. $2 + 1 + 2$
3. a) What is angle modulation ?
b) Write the advantages and disadvantages of FM compared to AM ?
c) State Carson's rule of FM bandwidth.
4. a) State sampling theorem. Define aliasing.
b) Make comparison of different pulse analog modulation methods. $2 + 3$
5. Discuss the indirect method of generating a wide-band FM signal. $3 + 2$
6. a) An SSB signal contains 1 kW power. How much power is contained in the side band and how much at the carrier frequency ?
b) What is VSB modulation ? $2 + 2 + 1$

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Define the following terms :
Block Code, Code Vectors, Code Weight, Code Word.



- b) Consider a (7, 4) linear block code whose generator matrix is given below :

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

Find the code vector for a message 1011 and also the parity check matrix.

- c) The parity check bits of an (8 , 4) block code are given by,

$$c_1 = m_1 + m_2 + m_3$$

$$c_2 = m_1 + m_2 + m_3$$

$$c_3 = m_1 + m_3 + m_4$$

$$c_4 = m_2 + m_3 + m_4$$

Find generator matrix and parity check for this code.

- d) What is Hamming code ? 4 + 5 + 5 + 1

8. a) Explain the detection of AM signals using envelope detector.

b) Explain with block diagram low level and high level modulation techniques.

c) A transmitter radiates 9 kW without modulation and 10.125 kW after modulation. Determine depth of modulation.

d) Find the bandwidth of a commercial FM transmission, if frequency deviation is 75 kHz and modulating frequency is 15 kHz. 4 + 4 + 4 + 3



9. a) Explain with the block diagram the generation and detection process of PCM.
- b) A telephone signal has a maximum frequency of 4 kHz. It is limited within the voltage of +V & -V. It is transmitted by using PCM. The required signal to quantization noise ratio is 40 dB. What is the minimum bandwidth required for the transmission ?
- c) Distinguish between ASK, FSK and PSK in terms of their performances.
- d) Encode the bit sequence 10110011010 in the NRZ-polar and RZ-bipolar format. 6 + 4 + 3 + 2
10. a) What is satellite ? Explain Kepler's law of planetary motion.
- b) Find out the height of the geostationary satellite.
- c) Explain the satellite uplink model.
- d) Define Lock Angles. 4 + 4 + 5 + 2
11. Write short notes on any *three* of the following : 3 × 5
- a) Balanced Modulator
- b) Super-heterodyne receiver
- c) Frequency Shift Keying
- d) Satellite Link Model
- e) Error Detection Methods.

=====